

README

Fire INventory from NCAR (FINN) version v2.2

November 25, 2020

These are the first publicly released emission files for FINNv2.

Emissions files produced between May and November 2020 by Christine Wiedinmyer and Keenan Seto. Please send any feedback, comments, or questions to Christine Wiedinmyer (christine.wiedinmyer@colorado.edu).

Fire data were downloaded from December 2019 – January 2020 from the NASA Fire Information for Resource Management System (FIRMS, <https://firms.modaps.eosdis.nasa.gov/download/>). MODIS data are available from 2002-2019 and VIIRS data from 2012-2019. Date ranges for each year started on December 30 of the previous year to January 1 of the following year, to account for time zone differences.

The FINNv2 input files were created between January and February 2020. The emissions were calculated using the FINNv2.2 IDL in March 2020.

The emissions of non-methane organic compounds (NMOC) have been speciated either to the MOZART-T1 chemical mechanism (Emmons et al., *JAMES*, <https://doi.org/10.1029/2019MS001882>), the SAPRC99 chemical mechanism (Carter et al., 2000), and the GEOS-CHEM mechanism (Bey et al., 2001; <http://www.geos-chem.org/>). The mapping of the NMOCs to the SAPRC99 and GEOS-CHEM mechanisms has not changed from FINNv1 and is described by Wiedinmyer et al., *GMD*, 2011 (See factors in Tables 4 and 5 of that publication). The NMOC mapping to the MOZART-T1 mechanism is new and will be described in the FINNv2 paper (*in preparation*).

All files contain daily fire emission estimates for the globe for the year specified at a resolution of $\sim 1\text{km}^2$.

Please cite any use of these files as FINNv2.2 and identify whether you use the MODIS-only files, or those with MODIS+VIIRS fire inputs. Also, please note the mechanism to which the NMOC are mapped and the version of that speciation and the date of download

The reference for the FINNv1 estimates is:

Wiedinmyer, C., Akagi, S. K., Yokelson, R. J., Emmons, L. K., Al-Saadi, J. A., Orlando, J. J., and Soja, A. J.: The Fire INventory from NCAR (FINN): a high resolution global model to estimate the emissions from open burning, *Geosci. Model Dev.*, 4, 625–641, <https://doi.org/10.5194/gmd-4-625-2011>, 2011.

The reference for FINNv2.2 emissions here is in progress. The reference will be updated when available:

Wiedinmyer, C., Kimura, Y., McDonald-Buller, E., Seto, K., Emmons, L., Tang, W., Buccholz, R., Orlando, J. The Fire INventory from NCAR version 2 (FINNv2): updates to a high resolution global fire emissions model. In preparation for submission to the *Journal of Advances in Modeling Earth Systems*.

Each fire point identified by satellites are assigned a POLYID. Each POLYID is assigned to a FIREID. If multiple fire points are located together as part of a big fire, they are assigned to the same FIREID.

The categories for GENVEG are:

- 1 = grasslands and savanna
- 2 = woody savanna/shrublands
- 3 = tropical forest
- 4 = temperate forest
- 5 = boreal forest
- 6 = temperate evergreen forest
- 9 = croplands
- 0 = no vegetation

The files available for download here are gzipped, comma-delimited ASCII files.

There are three types of files to be downloaded:

- MOZART-T1 speciation (version 2.0)
- SAPRC99 speciation (version 1.0)
- GEOS-CHEM speciation (version 1.0)

***** NOTE: The output for all contains different fields than FINNv1 ******

The first line in each file includes the headers of each field.

The MOZART-T1 files contain the following fields:

DAY	Julian Day (day of year)
POLYID	ID associated with each fire point
FIREID	FIRE ID for which each POLYID is assigned
GENVEG	Generic Vegetation type where fire occurred (See list above)
LATI	Latitude (decimal degrees)
LONGI	Longitude (decimal degrees)
AREA	Area burned (m ²) for fire point <i>(NOTE: for larger fires, sum area for each FIREID to get total area burned)</i>
BMASS	Biomass burned per area burned (kg/m ²)
CO2	CO ₂ emissions (mole CO ₂ /day)
CH4	CH ₄ emissions (mole CH ₄ /day)
CO	CO emissions (mole CO/day)
NOX	NO _x emissions (mole NO _x /day)
NO	NO emissions (mole NO/day)
NO2	NO ₂ emissions (mole NO ₂ /day)
SO2	SO ₂ emissions (mole SO ₂ /day)
NH3	NH ₃ emissions (mole NH ₃ /day)
PM25	PM _{2.5} emissions (kg PM _{2.5} /day)
OC	Particulate Organic Carbon emissions (kg OC/day)
BC	Particulate Black Carbon emissions (kg BC/day)

PM10	PM10 emissions (kg PM10/day)
NMOC	Total NMOC emissions (kg NMOC/day)
APIN	alpha-pinene (C ₁₀ H ₁₆) (moles/day)
BENZENE	benzene (C ₆ H ₆) (moles/day)
BIGALK	lumped alkanes C>3 (C ₅ H ₁₂) (moles/day)
BIGENE	lumped alkenes C>3 (C ₄ H ₈) (moles/day)
BPIN	beta-pinene (C ₁₀ H ₁₆) (moles/day)
BZALD	benzaldehyde (C ₇ H ₆ O) (moles/day)
C2H2	ethyne (acetylene) (C ₂ H ₂) (moles/day)
C2H4	ethene (C ₂ H ₄) (moles/day)
C2H6	ethane (C ₂ H ₆) (moles/day)
C3H6	propene (C ₃ H ₆) (moles/day)
C3H8	propane (C ₃ H ₈) (moles/day)
CH2O	formaldehyde (CH ₂ O) (moles/day)
CH3CH2OH	ethanol (C ₂ H ₅ OH) (moles/day)
CH3CHO	acetaldehyde (CH ₃ CHO) (moles/day)
CH3CN	acetonitrile (CH ₃ CN) (moles/day)
CH3COCH3	acetone (CH ₃ COCH ₃) (moles/day)
CH3COOH	acetic acid (CH ₃ COOH) (moles/day)
CH3OH	methanol (CH ₃ OH) (moles/day)
CRESOL	lumped cresols (hydroxymethylbenzenes) (C ₇ H ₈ O) (moles/day)
GLYALD	glycolaldehyde (HOCH ₂ CHO) (moles/day)
HCN	hydrogen cyanide (moles/day)
HCOOH	formic acid (moles/day)
HONO	nitrous acid (moles/day)
HYAC	hydroxyacetone (CH ₃ COCH ₂ OH) (moles/day)
ISOP	isoprene (C ₅ H ₈) (moles/day)
LIMON	limonene (C ₁₀ H ₁₆) (moles/day)
MACR	methacrolein (CH ₂ CCH ₃ CHO) (moles/day)
MEK	methyl ethyl ketone (C ₄ H ₈ O) (moles/day)
MGLY	methyl glyoxal (CH ₃ COCHO) (moles/day)
MVK	methyl vinyl ketone (CH ₂ CHCOCH ₃) (moles/day)
MYRC	myrcene (C ₁₀ H ₁₆) (moles/day)
PHENOL	phenol (C ₆ H ₅ OH) (moles/day)
TOLUENE	toluene (C ₇ H ₈) (moles/day)
XYLENE	lumped xylenes (C ₈ H ₁₀) (moles/day)
XYLOL	dimethyl phenol from xylenes oxidation (C ₈ H ₁₀ O) (moles/day)

GEOS-CHEM FILE FIELDS

DAY	Julian Day (day of year)
POLYID	ID associated with each fire point
FIREID	FIRE ID for which each POLYID is assigned
GENVEG	Generic Vegetation type where fire occurred (See list above)
LATI	Latitude (decimal degrees)
LONGI	Longitude (decimal degrees)
AREA	Area burned (m ²) for fire point (<i>NOTE: for larger fires, sum area for each FIREID to get total area burned</i>)
BMASS	Biomass burned per area burned (kg/m ²)
CO2	CO ₂ emissions (mole CO ₂ /day)
CO	CO emissions (mole CO/day)
NO	NO emissions (mole NO/day)
NO2	NO ₂ emissions (mole NO ₂ /day)
SO2	SO ₂ emissions (mole SO ₂ /day)
NH3	NH ₃ emissions (mole NH ₃ /day)
CH4	CH ₄ emissions (mole CH ₄ /day)
VOC	VOC emissions (mole VOC/day)
ACET	ACET emissions (mole ACET /day)
ALD2	ALD ₂ emissions (mole ALD ₂ /day)
ALK4	ALK ₄ emissions (mole ALK ₄ /day)
BENZ	BENZ emissions (mole BENZ/day)
C2H2	C ₂ H ₂ emissions (mole C ₂ H ₂ /day)
C2H4	C ₂ H ₄ emissions (mole C ₂ H ₄ /day)
C2H6	C ₂ H ₆ emissions (mole C ₂ H ₆ /day)
C3H8	C ₃ H ₈ emissions (mole C ₃ H ₈ /day)
CH2O	CH ₂ O emissions (mole CH ₂ O/day)
GLYC	GLYC emissions (mole GLYC/day)
GLYX	GLYX emissions (mole GLYX/day)
HAC	HAC emissions (mole HAC/day)
MEK	MEK emissions (mole MEK/day)
MGLY	MGLY emissions (mole MGLY/day)
PRPE	PRPE emissions (mole PRPE/day)
TOLU	TOLU emissions (mole TOLU/day)
XYLE	XYLE emissions (mole XYLE/day)
OC	Particulate Organic Carbon emissions (kg OC/day)
BC	Particulate Black Carbon emissions (kg BC/day)
PM25	PM _{2.5} emissions (kg PM _{2.5} /day)

SAPRC99 FILE FIELDS

DAY	Julian Day (day of year)
POLYID	ID associated with each fire point
FIREID	FIRE ID for which each POLYID is assigned
GENVEG	Generic Vegetation type where fire occurred (See list above)
LATI	Latitude (decimal degrees)
LONGI	Longitude (decimal degrees)
AREA	Area burned (m ²) for fire point <i>(NOTE: for larger fires, sum area for each FIREID to get total area burned)</i>
BMASS	Biomass burned per area burned (kg/m ²)
CO2	CO ₂ emissions (mole CO ₂ /day)
CO	CO emissions (mole CO/day)
NO	NO emissions (mole NO/day)
NO2	NO ₂ emissions (mole NO ₂ /day)
SO2	SO ₂ emissions (mole SO ₂ /day)
NH3	NH ₃ emissions (mole NH ₃ /day)
CH4	CH ₄ emissions (mole CH ₄ /day)
VOC	VOC emissions (mole VOC/day)
ACET	ACET emissions (mole ACET/day)
ALK1	ALK1 emissions (mole ALK1/day)
ALK2	ALK2 emissions (mole ALK2/day)
ALK3	ALK3 emissions (mole ALK3/day)
ALK4	ALK4 emissions (mole ALK4/day)
ALK5	ALK5 emissions (mole ALK5/day)
ARO1	ARO1 emissions (mole ARO1/day)
ARO2	ARO2 emissions (mole ARO2/day)
BALD	BALD emissions (mole BALD/day)
CCHO	CCHO emissions (mole CCHO/day)
CCO_OH	CCO_OH emissions (mole CCO_OH/day)
ETHENE	ETHENE emissions (mole ETHENE/day)
HCHO	HCHO emissions (mole HCHO/day)
HCN	HCN emissions (mole HCN/day)
HCOOH	HCOOH emissions (mole HCOOH/day)
HONO	HONO emissions (mole HONO/day)
ISOPRENE	ISOPRENE emissions (mole ISOPRENE/day)
MEK	MEK emissions (mole MEK/day)
MEOH	MEOH emissions (mole MEOH/day)
METHACRO	METHACRO emissions (mole METHACRO/day)
MGLY	MGLY emissions (mole MGLY/day)
MVK	MVK emissions (mole MVK/day)
OLE1	OLE1 emissions (mole OLE1/day)
OLE2	OLE2 emissions (mole OLE2/day)
PHEN	PHEN emissions (mole PHEN/day)

PROD2	PROD2 emissions (mole PROD2/day)
RCHO	RCHO emissions (mole RCHO/day)
RNO3	RNO3 emissions (mole RNO3/day)
TRP1	TRP1 emissions (mole TRP1/day)
OC	Particulate Organic Carbon emissions (kg OC/day)
BC	Particulate Black Carbon emissions (kg BC/day)
PM25	PM2.5 emissions (kg PM2.5/day)
PM10	PM10 emissions (kg PM10/day)